Appendix A

TABLE A-2 SW8081A-Organochlorine Pesticides

Organochlorine pesticides in water and soil samples are analyzed using method SW8081A. This analytical method involves the extraction of the samples. The pesticides are then separated and quantified by GC using electron capture detection. Reporting limits (RLs) for this method are presented in the following table. The calibration, QC, corrective action, and data flagging requirements are given in the following tables.

TABLE A-2.A
RLs for Method SW8081A

		Water		Soil	
Parameter/Method	**Analyte**	**RL**	**Unit**	**RL**	**Unit**
Organochlorine	α-BHC	0.0135	µg/L	1.7	µg/kg
Pesticides	β-BHC	0.05	µg/L	1.7	µg/kg
SW8081A	δ-BHC	0.05	µg/L	1.7	µg/kg
	γ-BHC (Lindane)	0.05	µg/L	1.7	µg/kg
	α-Chlordane	0.05	µg/L	1.7	µg/kg
	γ-Chlordane	0.05	µg/L	1.7	µg/kg
	4,4'-DDD	0.1	µg/L	3.3	µg/kg
	4,4'-DDE	0.1	µg/L	3.3	µg/kg
	4,4'-DDT	0.1	µg/L	3.3	µg/kg
	Aldrin	0.05	µg/L	1.7	µg/kg
	Dieldrin	0.00532	µg/L	3.3	µg/kg
	Endosulfan I	0.05	µg/L	1.7	µg/kg
	Endosulfan II	0.1	µg/L	3.3	µg/kg
	Endosulfan Sulfate	0.1	µg/L	3.3	µg/kg
	Endrin	0.1	µg/L	3.3	µg/kg
	Endrin Aldehyde	0.1	µg/L	3.3	µg/kg
	Endrin Ketone	0.1	µg/L	3.3	µg/kg
	Heptachlor	0.05	µg/L	1.7	µg/kg
	Heptachlor Epoxide	0.05	µg/L	1.7	µg/kg
	Methoxychlor	0.5	µg/L	17	µg/kg
	Toxaphene	3	µg/L	170	µg/kg

TABLE A-2.B
QC Acceptance Criteria for Method SW8081A

Method	**Analyte**	**Accuracy Water (% R)**	**Precision Water (% RPD)**	**Accuracy Soil (% R)**	**Precision Soil (% RPD)**
SW8081A	α-BHC	75–125	≤ 30	65–135	≤ 50
	β-BHC	51–125	≤ 30	41–133	≤ 50
	δ-BHC	75–126	≤ 30	65–136	≤ 50

Method	Analyte	Accuracy Water (% R)	Precision Water (% RPD)	Accuracy Soil (% R)	Precision Soil (% RPD)
	γ-BHC (Lindane)	73–125	≤ 30	63–130	≤ 50
	α-Chlordane	41–125	≤ 30	31–135	≤ 50
	γ-Chlordane	41–125	≤ 30	31–133	≤ 50
	4,4-DDD	48–136	≤ 30	38–146	≤ 50
	4,4-DDE	45–139	≤ 30	35–149	≤ 50
	4,4-DDT	34–143	≤ 30	25–153	≤ 50
	Aldrin	47–125	≤ 30	37–126	≤ 50
	Dieldrin	42–132	≤ 30	32–142	≤ 50
	Endosulfan I	49–143	≤ 30	39–153	≤ 50
	Endosulfan II	75–159	≤ 30	65–169	≤ 50
	Endosulfan Sulfate	46–141	≤ 30	36–151	≤ 50
	Endrin	43–134	≤ 30	33–144	≤ 50
	Endrin Aldehyde	75–150	≤ 30	65–160	≤ 50
	Heptachlor	45–128	≤ 30	35–138	≤ 50
	Heptachlor Epoxide	53–134	≤ 30	43–144	≤ 50
	Methoxychlor	73–142	≤ 30	63–152	≤ 50
	Toxaphene	41–126	≤ 30	31–136	≤ 50
	Surrogates:				
	DCBP	34–133		25–143	
	TCMX	45–125		35–135	

TABLE A-2.C
Summary of Calibration and QC Procedures for Method SW8081A

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
SW8081A	Organo-chlorine pesticides	Five-point initial calibration for all analytes	Initial calibration prior to sample analysis	linear – all analyte %RSD ≤20% or can use mean RSD for all analytes ≤20% with no individual analyte RSD >30% Linear – least squares regression r ≥ 0.99 non-linear – COD ≥ 0.990 (6 points shall be used for second order, 7 points shall be	Correct problem then repeat initial calibration	Apply J to positive results and UJ to non-detects for specific analyte(s) for all samples associated with the calibration

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
				used for third order)		
		Retention time window calculated for each analyte	Each initial calibration and calibration verifications	± 3 times standard deviation for each analyte retention time from 72-hour study	Correct problem then reanalyze all samples analyzed since the last retention time check	Apply R to all results for the specific analyte(s) in the sample
		Initial calibration verification	Daily, before sample analysis	All analytes within ±15% of expected value	Correct problem then repeat initial calibration	Apply J to all positive results and UJ to non-detects for all results for specific analyte(s) for all samples associated with the calibration
		Calibration verification	Minimally, after every 20 samples (but after every 10 is recommended)	All analytes within ±15% of expected value However, if the std analyzed after a group of samples exhibits a response for an analyte that is above the acceptance limit, i.e., >15%, and the analyte was not detected in any of the previous samples during the analytical shift, then the sample extracts do not need to be reanalyzed, as the CCV std has demonstrated that the analyte would have been detected were it present.	Correct problem then repeat initial calibration verification and reanalyze all samples since last successful calibration verification	Apply J to all positive results and UJ to non-detects for all results for the specific analyte(s) in all samples since the last acceptable calibration verification
SW8081A	Organo-chlorine pesticides	Breakdown check (Endrin and DDT)	Daily prior to analysis of samples and at the beginning of each 12-hour shift.	Degradation ≤15%	Repeat breakdown check	Apply J to all positive DDT, DDE, DDD, endrin, endrin ketone and endrin aldehyde results if percent degradation is exceeded; if minimum frequency is not met, professional judgement should be used to determine if data should be qualified as estimated or rejected.
		Method blank	One per analytical batch	No analytes detected ≥ RL	Correct problem then reprep and analyze method	Apply U to all results for the specific analyte(s)

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
					blank and all samples processed with the contaminated blank	in all samples in the associated analytical batch whose concentration is less than 5 times blank concentration.
		LCS for analytes listed in table.	One LCS per analytical batch	QC acceptance criteria in table.	Correct problem then reprep and analyze the LCS and all samples in the affected analytical batch	Don't flag on LCS results alone. Professional judgement used to evaluate LCS, IS, surrogates, & MS/MSD, then flag accordingly.
SW8081A	Organo-chlorine pesticides	Surrogate spike	Every sample, spiked sample, standard, and method blank	QC acceptance criteria in table.	Correct problem then reextract and analyze sample	For the samples; if the %R > UCL for any surrogate, apply J to all positive results if the %R < LCL for any surrogate, apply J to all positive results, apply UJ to all non-detects If any surrogate recovery is < 10%, J flag positive results and R flag non-detects.
		MS/MSD	One MS/MSD per every 40.In addition, if samples are expected to contain the target analytes of concern, then lab may use MS and duplicate instead of a MS/MSD.	QC acceptance criteria in table.	If MS/MSD does not meet recovery criteria, evaluate LCS to determine if matrix is cause of problem.	Flags not applied on MS/MSD results alone. MS/MSD should be evaluated in conjunction with LCS, surrogates, and IS.
		Second-column confirmation	100% for all positive results for unfamiliar samples. Note: Confirmation may not be necessary if pesticide is known to be present based on prior analyses established by prior analyses,	Same as for initial or primary column analysis	Same as for initial or primary column analysis	Apply R to the result for the specific analyte(s) in the sample not confirmed (if confirmation required). Apply J if RPD >40% from first column result
		MDL study	Once per 12 month period	Detection limits established shall be ≤ the RLs in table.	None	Apply R to all results for the specific analyte(s)

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
						in all samples analyzed
		Results reported between MDL and RL	None	none	None	Apply J to all results between MDL and RL

a. All corrective actions associated with project work shall be documented, and the laboratory shall maintain all Records.
b. Flagging criteria are applied when acceptance criteria were not met and corrective action was not successful or corrective action was not performed.

TABLE A-3 Method SW8082-Polychlorinated Biphenyls (PCBs)

PCBs in water and soil samples are analyzed using method SW8082. This analytical method involves the extraction of the samples. The PCBs are then separated and quantified by GC using electron capture detection or electrolytic conductivity detection. Practical quantitation limits (RLs) for this method are presented in the following table. The calibration, QC, corrective action, and data flagging requirements are given in following tables.

A standard containing a mixture of Aroclor 1016 and Aroclor 1260 will include many of the peaks represented in the other five Aroclor mixtures. As a result, a multi-point initial calibration employing a mixture of Aroclors 1016 and 1260 at five concentrations should be sufficient to demonstrate the linearity of the detector response without the necessity of performing initial calibrations for each of the seven Aroclors. In addition, such a mixture can be used as a standard to demonstrate that a sample does not contain peaks that represent any one of the Aroclors. This standard can also be used to determine the concentrations of either Aroclor 1016 or Aroclor 1260, should they be present in a sample. The concentrations should correspond to the expected range of concentrations found in real samples and should bracket the linear range of the detector.

Single standards of each of the other five Aroclors are required to aid the analyst in pattern recognition. The single standards of the remaining five Aroclors are also used to determine the calibration factor for each Aroclor. The concentrations should correspond to the mid-point of the linear range of the detector.

Retention times shall be verified for all analytes during the initial five-point calibration. The daily calibration, initial calibration verification and the calibration verification may be done using only a mixture of PCB-1016 and PCB-1260. If a PCB is present (i.e., above the MDL), report the result of the PCB using the response factors from the initial five-point calibration. The LCS and MS/MSD may only be spiked with the 1016/1260 mix.

TABLE A-3.A
RLs for Method SW8082

		Water		Soil	
Parameter/Method	Analyte	RL	Unit	RL	Unit
PCBs	PCB-1016	0.5	µg/L	33	µg/kg
	PCB-1221	0.5	µg/L	67	µg/kg
	PCB-1232	0.5	µg/L	33	µg/kg
	PCB-1242	0.5	µg/L	33	µg/kg
	PCB-1248	0.5	µg/L	33	µg/kg
	PCB-1254	0.5	µg/L	33	µg/kg
	PCB-1260	0.5	µg/L	33	µg/kg

TABLE A-3.B
QC Acceptance Criteria for Method SW8082

Method	Analyte	Accuracy Water (% R)	Precision Water (% RPD)	Accuracy Soil (% R)	Precision Soil (% RPD)
SW8082	PCB-1016	54–125	≤ 30	44–127	≤ 50
	PCB-1260	41–126	≤ 30	31–136	≤ 50
	Surrogate:				
	DCBP	34–133		25–143	

TABLE A-3.C
Summary of Calibration and QC Procedures for Method SW8082

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
SW8082	PCBs	Five point of 1016/1260 mix & single level for all other aroclors	Initial calibration prior to sample analysis	Linear - – all analyte %RSD ≤20% or can use mean RSD for all analytes ≤20% with no individual analyte RSD >30% Linear – least squares regression r ≥ 0.99 non-linear – COD ≥ 0.990 (6 points shall be used for second order, 7 points shall be used for third order)	Correct problem then repeat initial calibration	Apply J flag to positive results and UJ to non-detects for specific analyte(s) for all samples associated with the calibration
		Retention time window calculated for PCB 1016/1260 mix	Each initial calibration and calibration verifications	± 3 times standard deviation for each analyte retention time from 72-hour study	Correct problem then reanalyze all samples analyzed since the last retention time check	Apply R to all results for the specific analyte(s) in the sample
		Initial calibration verification for PCB 1016/1260 mix	Daily, before sample analysis	All analytes within ±15% of expected value	Correct problem then repeat initial calibration	Apply J to all positive results and UJ to non-detects for all PCB results for all samples associated with the calibration
		Calibration verification for PCB 1016/1260	After every 20 samples and at the end of the analysis sequence	All analytes within ±15% of expected value All analytes within ±15% of	Correct problem then repeat initial calibration verification and reanalyze all	Apply J to all positive results and UJ to non-detects for all results for the

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
		mix		expected value However, if tests analyzed after a group of samples exhibits a response for an analyte that is above the acceptance limit, i.e., >15%, and the analyte was not detected in any of the previous samples during the analytical shift, then the sample extracts do not need to be reanalyzed, as the CCV std has demonstrated that the analyte would have been detected were it present.	samples since last successful calibration verification	specific analyte(s) in all samples since the last acceptable calibration verification
SW8082	PCBs					
		Method blank	One per analytical batch (every 20 samples)	No analytes detected ≥ RL	Correct problem then reprep and analyze method blank and all samples processed with the contaminated blank	Apply U to all results for the specific analyte(s) in all samples in the associated analytical batch whose concentration is less than 5 times blank concentration.
		LCS (1016/1260 mix)	One LCS per analytical batch	QC acceptance criteria in table.	Correct problem then reprep and analyze the LCS and all samples in the affected AFCEE analytical batch	Don't flag on LCS results alone. Professional judgement used to evaluate LCS, IS, MS/MSD and flag accordingly.
SW8082	PCBs	Surrogate spike	Every sample, spiked sample, standard, and method blank	QC acceptance criteria in table.	Correct problem then reextract and analyze sample	For the samples; If the %R > UCL for the surrogate apply J to all positive results if the %R < LCL for the surrogate, apply J to all positive results, apply UJ to all non-detects If the surrogate recovery is < 10%, apply J flag to positive results and

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
						R flag to non-detects.
		MS/MSD (1016/1260 mix)	One MS/MSD per every 40 samples	QC acceptance criteria in table.	If MS/MSD does not meet recovery criteria, evaluate LCS to determine if matrix is cause of problem.	Flags not applied on MS/MSD results alone. MS/MSD should be evaluated in conjunction with LCS, surrogates, and IS.
		Second-column confirmation	100% for all positive results for unfamiliar samples. Note: Confirmation may not be necessary if pesticide is known to be present based on prior analyses established by prior analyses,	Same as for initial or primary column analysis	Same as for initial or primary column analysis	Apply R to the result for the specific analyte(s) in the sample not confirmed (if confirmation required). Apply J if RPD >40% from first column result
		MDL study	Once per 12 month period	Detection limits established shall be ≤ ½ the RLs in table.	none	Apply R to all results for the specific analyte(s) in all samples analyzed
		Results reported between MDL and RL	none	none	none	Apply J to all results between MDL and RL

a. All corrective actions associated with project work shall be documented, and the laboratory shall maintain all records.
b. Flagging criteria are applied when acceptance criteria were not met and corrective action was not successful or corrective action was not performed.

TABLE A-4 Method SW8260B-Volatile Organics

Volatile (or purgeable) organics in water and soil samples are analyzed using method SW8260B. This method uses a capillary column GC/mass spectrometry technique. Volatile compounds are introduced into the GC by purge and trap (SW5030B or SW5035). An inert gas is bubbled through the water samples (or a soil-water slurry for soil samples) to transfer the purgeable organic compounds from the liquid to vapor phase. Soil samples with higher contaminant levels are extracted using methanol before purging. The vapor is then swept through a sorbent trap where the purgeable organics are trapped. The trap is backflushed and heated to desorb the purgeable organics onto a capillary GC column where they are separated and then detected with a mass spectrometer. The analytes detected and RLs (using a 25 mL purge) for this method are listed in the following table.

Calibration—The mass spectrometer is tuned daily to give an acceptable spectrum for BFB. The tuning acceptance criteria are given in the following list as an ion abundance for each specified mass (alternatively, other documented tuning criteria may be used (e.g., CLP, Method 524.2, or manufacturer's instructions), provided that method performance is not adversely affected):

- mass 50 15 percent to 40 percent of mass 95
- mass 75 30 percent to 60 percent of mass 95
- mass 95 base peak, 100 percent relative abundance
- mass 96 5 percent to 9 percent of mass 95
- mass 173 less than 2 percent of mass 174
- mass 174 greater than 50 percent of mass 95
- mass 175 5 percent to 9 percent of mass 174
- mass 176 greater than 95 percent, but less than 101 percent of mass 174
- mass 177 5 percent to 9 percent of mass 176

The IS method is used for quantitation of analytes of interest. For quantitation, RFs are calculated from the base ion peak of a specific IS added to each calibration standard, blank, QC sample, and sample. The calibration, QC, corrective action, and data flagging requirements are given in the following tables.

TABLE A-4.A
RLs for Method SW8260B

		Water		Soil	
Parameter/Method	**Analyte**	**RL**	**Unit**	**RL**	**Unit**
VOCs	Chloromethane	1	µg/L	10	µg/kg
SW8260B	Bromomethane	1	µg/L	10	µg/kg
	Vinyl Chloride	1	µg/L	10	µg/kg
	Chloroethane	1	µg/L	10	µg/kg
	Methylene Chloride	2	µg/L	5	µg/kg
	Acetone	5	µg/L	10	µg/kg
	Carbon Disulfide	1	µg/L	5	µg/kg
	1,1-Dichloroethene	1	µg/L	5	µg/kg

Parameter/Method	Analyte	Water RL	Water Unit	Soil RL	Soil Unit
	1,1-Dichloroethane	1	µg/L	5	µg/kg
	1,2-Dichloroethene (Total)	1	µg/L	5	µg/kg
	cis- 1,2-Dichloroethene	1	µg/L	5	µg/kg
	trans-1,2-Dichloroethene	1	µg/L	5	µg/kg
	Chloroform	1	µg/L	5	µg/kg
	1,2-Dichloroethane	1	µg/L	5	µg/kg
	2-Butanone	5	µg/L	10	µg/kg
	1,1,1-Trichloroethane	1	µg/L	5	µg/kg
	Carbon tetrachloride	1	µg/L	5	µg/kg
	Vinyl Acetate	5	µg/L	10	µg/kg
	Bromodichloromethane	1	µg/L	5	µg/kg
	1,2-Dichloropropane	1	µg/L	5	µg/kg
	Cis-1,3-Dichloropropene	1	µg/L	5	µg/kg
	Trichloroethene	1	µg/L	5	µg/kg
	Dibromochloromethane	1	µg/L	5	µg/kg
	1,1,2-Trichloroethane	1	µg/L	5	µg/kg
	Benzene	1	µg/L	5	µg/kg
	Trans-1,3-Dichloropropene	1	µg/L	5	µg/kg
	Bromoform	1	µg/L	5	µg/kg
	2-Hexanone	5	µg/L	10	µg/kg
	4-Methyl-2-pentanone	5	µg/L	10	µg/kg
	Tetrachloroethene	1	µg/L	5	µg/kg
	1,1,2,2-Tetrachloroethane	1	µg/L	5	µg/kg
	Toluene	1	µg/L	5	µg/kg
	Chlorobenzene	1	µg/L	5	µg/kg
	Ethylbenzene	1	µg/L	5	µg/kg
	Styrene	1	µg/L	5	µg/kg
	Xylenes (Total)	1	µg/L	5	µg/kg

TABLE A-4.B
QC Acceptance Criteria for Method SW8260B

Method	Analyte	Accuracy Water (% R)	Precision Water (% RPD)	Accuracy Soil (% R)	Precision Soil (% RPD)	Assoc. IS
SW8260B	1,1,1-TCA	75–125	≤ 20	65–135	≤ 30	1
	1,1,2,2-Tetrachloroethane	74–125	≤ 20	64–135	≤ 30	3
	1,1,2-TCA	75–127	≤ 20	65–135	≤ 30	1

Method	Analyte	Accuracy Water (% R)	Precision Water (% RPD)	Accuracy Soil (% R)	Precision Soil (% RPD)	Assoc. IS
	1,1-DCA	72–125	≤ 20	62–135	≤ 30	1
	1,1-DCE	75–125	≤ 20	65–135	≤ 30	1
	1,2-DCA	68–127	≤ 20	58–137	≤ 30	1
	1,2-Dichloroethene (Total)	75-125	≤ 20	65-135	≤30	
	1,2-Dichloropropane	70–125	≤ 20	60–135	≤ 30	1
	2-Butanone	50-150	≤ 20	50-150	≤ 30	
	2-Hexanone	50-150	≤ 20	50-150	≤ 30	
	4-Methyl-2-pentanone	50-150	≤ 20	50-150	≤ 30	
	Acetone	50-150	≤20	50-150	≤ 30	
	Benzene	75–125	≤ 20	65–135	≤ 30	1
	Bromodichloromethane	75–125	≤ 20	65–135	≤ 30	1
	Bromoform	75–125	≤ 20	65–135	≤ 30	2
	Bromomethane	72–125	≤ 20	62–135	≤ 30	1
	Carbon Disulfide	50-150	≤ 20	50-150	≤ 30	
	Carbon Tetrachloride	62–125	≤ 20	52–135	≤ 30	1
	Chlorobenzene	75–125	≤ 20	65–135	≤ 30	2
	Chloroethane	65–125	≤ 20	55–135	≤ 30	1
	Chloroform	74–125	≤ 20	64–135	≤ 30	1
	Chloromethane	75-125	≤ 20	65–135	≤ 30	1
	Cis-1,2-DCE	75–125	≤ 20	65–135	≤ 30	1
	Cis-1,3-Dichloropropene	74–125	≤ 20	64–135	≤ 30	1
	Dibromochloromethane	73–125	≤ 20	63–135	≤ 30	2
	Ethylbenzene	75–125	≤ 20	65–135	≤ 30	2
	Methylene chloride	75–125	≤ 20	65–135	≤ 30	1
	Styrene	75–125	≤ 20	65–135	≤ 30	2
	Tetrachloroethene	71–125	≤ 20	61–135	≤ 30	2
	Toluene	74–125	≤ 20	64–135	≤ 30	1
	Trans-1,2-DCE	75–125	≤ 20	65–135	≤ 30	1
	Trans-1,3-Dichloropropene	66-125	≤20	56-135	≤30	
	Trichloroethene	71–125	≤ 20	61–135	≤ 30	1

Method	Analyte	Accuracy Water (% R)	Precision Water (% RPD)	Accuracy Soil (% R)	Precision Soil (% RPD)	Assoc. IS
	Vinyl Acetate	50-150	≤ 20	50-150	≤ 30	
	Vinyl Chloride	46–134	≤ 20	36–144	≤ 30	1
	Xylenes, total	75–125	≤ 20	65–135	≤ 30	2
	Surrogates:					
	Dibromofluoromethane	75–131		65–135		
	Toluene-D8	68–125		65–135		
	4-Bromofluorobenzene	75–125		65–135		
	1,2-DCA-D4	62–139		52–149		
	Internal Standards:					
	Fluorobenzene					1
	Chlorobenzene-D5					2
	1,4-Dichlorobenzene-D4					3

TABLE A-4.C
Summary of Calibration and QC Procedures for Method SW8260B

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
SW8260B	Volatile Organics	Five-point initial calibration for all analytes	Initial calibration prior to sample analysis	Initial cal. Stds. RRF ≥ 0.05 SPCCs average RF ≥ 0.30[c] and %RSD for RFs for CCCs ≤ 30% and one option below *Option 1 linear*- RSD ≤ 15% for each analyte or mean RSD for all analytes ≤15% with no individual analyte RSD >30% *Option 2 linear* – least squares regression r ≥ 0.99 *Option 3 non-linear* – COD ≥ 0.990 (6 points shall be used for second order, 7 points shall	Correct problem then repeat initial calibration	If ≥ 30%, and ICS RRF ≥ 0.05, J flag positive results. If ICS RRF <0.05, J flag positive results, and R flag non-detects.

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
				be used for third order)		
		Retention time window calculated for each analyte	Each sample	Relative retention time (RRT) of the analyte within ± 0.06 RRT units of the RRT	Correct problem then reanalyze all samples analyzed since the last retention time check	Apply R to all results for the specific analyte(s) in the sample
		Calibration verification	Daily, before sample analysis and every 12 hours of analysis time	SPCCs average RF ≥ 0.30[c]; and CCCs ≤ 20% difference (when using RFs) or drift (when using least squares regression or non-linear calibration)	Correct problem then repeat initial calibration	Apply R to all results for all samples associated with the calibration verification
				All calibration analytes within ±30% of expected value		Apply J to all positive results and UJ to non-detects for all results for specific analyte(s) for all samples associated with the calibration verification
SW8260B	Volatile Organics					
		ISs	Immediately after or during data acquisition for each sample	Retention time ±30 seconds from retention time of the mid-point std. In the ICAL. EICP area within -50% to +100% of ICAL mid-point std.	Inspect mass spectrometer and GC for malfunctions; mandatory reanalysis of samples analyzed while system was malfunctioning	Apply J to positive results. If IS area <50%, UJ non-detects. If IS area <10%, R flag non-detects.
		Method blank	One per analytical batch	No analytes detected ≥ RL	Correct problem then reprep and analyze method blank and all samples processed with the contaminated blank	Apply U to all results for the specific analyte(s) in all samples in the associated analytical batch whose concentration is less than 5 times blank concentration.
		LCS	One LCS per analytical batch	QC acceptance criteria in table.	Correct problem then reprep and analyze the LCS and all samples in the affected analytical batch	Flags applied in conjunction with performance of surrogates, internal stds, LCS, and MS/MSD
		MS/MSD	One MS/MSD per every 40 samples.	QC acceptance criteria in table.	none	Flags applied in conjunction with performance of surrogates, internal stds, LCS, and MS/MSD
SW8260B	Volatile	Check of	Prior to initial	Refer to criteria	Retune instrument	Apply R to all results

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
	Organics	mass spectral ion intensities using BFB	calibration and calibration verification	listed in the method description.	and verify	for all samples associated with the tune
		Surrogate spike	Every sample, spiked sample, standard, and method blank	QC acceptance criteria in table.	Correct problem then reextract and analyze sample	For the samples; if the %R > UCL for a surrogate, apply J to all positive results if the %R < LCL for a surrogate, apply J to all positive results; apply UJ to all non-detect results. If any surrogate recovery is <10%, J flag positive results and R flag non-detects.
		MDL study	Once per 12 month period	Detection limits established shall be ≤ ½ the RLs in table.	none	Apply R to all results for the specific analyte(s) in all samples analyzed
		Results reported between MDL and RL	none	None	none	Apply J to all results between MDL and RL
	Volatile Organics	Report TICs as required	Report TICs for largest peaks (10 for VOC, 20 for SVOC) which have area or height > 10% of area or height of nearest IS. TICs concentrations estimated by using RRF of 1.0	Relative intensities of major ions in reference spectrum should be present in sample spectrum and relative intensities should agree ± 20%		All TIC results should be qualified "J", tentatively identified, with approximated concentrations If tentative identification not accurate, uncertain, or extenuating factors affect ID, peak should be identified as "unknown" or as appropriate identification
						If TIC not in blank, but suspected artifact of common lab contaminant (or aldol condensation product, solvent preservative, reagent contaminant), flag result as unusable ("R")
						If lack of isomer specificity, TIC result should be changed to nonspecific isomer
						If more than one

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
						possible match, result may be reported as "either compound X or Y"
						Similar compounds may be reported as total (example "alkanes")

a. All corrective actions associated with project work shall be documented, and the laboratory shall maintain all records.
b. Flagging criteria are applied when acceptance criteria were not met and corrective action was not successful or corrective action was not performed.
c. Except > 0.10 for bromoform, and > 0.10 for chloromethane and 1,1-dichloroethane

Additional Guidance on the use of Method 5035.

The intent of Method 5035 is to collect the sample causing the least amount of disturbance to the soil structure and to transfer and seal the sample in a sample container with a hermetic seal. From the time of collection until after the analysis, the sample container remains unopened. The issues discussed in this document are intended to supplement the method in order to resolve and clarify some technical issues. For all procedures not specified in this document, the procedures specified in Method 5035 for sample collection, sample preparation, and sample analysis should be followed. The option to collect a bulk sample for quantitative analysis (Method 5035, sections 2.2.1 and 6.2.3) is not allowed. All samples for quantitative analysis must be collected using a coring device and must be either transferred in the field to a 40-mL vial which is then hermetically sealed, or the sample can be hermetically sealed in the sampling device. Method 5035 includes procedures for preparing low concentration samples (expected to contain VOCs between 5-200 ug/Kg) and high concentration samples (expected to contain greater than 200 ug/kg). Samples and/or media can be screened in the field using an organic vapor monitor (OVM) or other appropriate field instrument, and in the laboratory using a gas chromatography screening method, be conducted prior to selecting either the low or high concentration option for samples.

The recommended method of sample collection for both low and high concentration soils is to collect the sample using a coring device and to quickly extrude the sample core into a tared 40-mL vial that does not contain preservative but does contain the stir bar. The vial is quickly sealed and chilled, held at 4°C, and shipped to the laboratory. The vial remains unopened until after the analysis is complete. This collection procedure does not require the use of preservatives in the field or balances in the field.

1. Sample vials should be prepared in a fixed laboratory or other controlled environment. The tare weight of the sample vial including cap, septum, stir bar (if applicable), and the label, must be determined and recorded on the label prior to shipping the vials to the field for sample collection.

2. All samples for quantitative must be collected using a coring device and must be either transferred in the field to a 40-mL VOA vial which is then hermetically sealed, or the sample can be hermetically sealed in the sampling device.

a. Several devices are available commercially; however for this project the The EasyDraw Syringe™ and Powerstop Handle™ or equivalent will be used. (US Analytical Laboratory, 800-490-5092), www.usoil.com/lab)

b. The sample size collected should be approximately 5 grams. The coring device should be calibrated and be designed to minimize the disturbance of the sample during collection.

   1. A new device must be used for the collection of each new sample. The coring device can be used to collect multiple aliquots from the same sample point provided the integrity of the coring device is not compromised.

   2. Insert a cutoff syringe into the syringe holder.

   3. Push the syringe into the soil until the plunger strikes the stopper on the syringe holder.

   4. Remove the syringe and expel soil sample into the appropriate sample container. A jar for the bulk sample and three (seven if MS/MSD is required) tared 40-mL VOA vials (containing a stir bar) should be collected.

   5. For non-cohesive samples, the 5-gram sample should be quickly transferred into the 40-mL vial using a spatula.

   6. The threads of the vial are inspected and wiped clean.

   7. Screw cap firmly on vial.

   8. Vials are placed in plastic bags.

   9. The plastic bags containing the sample vials are sealed and placed on ice and submitted to the laboratory.

c. A bulk sample should be collected using the coring device and placed in a 4-ounce jar. This sample should be used for screening purposes in the laboratory, but not for quantitative analysis. After screening, the remaining contents of the sample jar may be used to determine the percent moisture, to check reactivity with sodium bisulfate (if the laboratory chooses to preserve the sample), and/or determine the appropriate extraction solvent, if necessary.

d. For low-level option, the entire sample is consumed during the analysis; therefore, a total of three samples (in addition to the bulk sample) will be collected at each sample point. This provides one sample for the analysis, one sample in case a dilution is required (methanol extraction), and one sample for reanalysis, if necessary.

e. If the sample point is to be used for the MS/MSD sample, the sample point should be representative of the sample matrix in a location where the level of contamination is expected to be at or near the regulatory limit. For low concentration soils, four additional samples should be collected from this sample point for a total of seven samples.

f. The use of sodium bisulfate in the field as a preservative is not recommended. Its use is limited to non- or low –calcareous soil samples (i.e., samples that do not effervesce when mixed with a sodium bisulfate solution).

3. The laboratory must measure and record the weight of the sample vial after receipt. The actual weight of the sample will be used for quantitation of results.

4. The integrity of the seal on the vials should be checked and any problems documented. Improperly sealed samples should not be used for analysis. If an integrity problem with the seal is discovered after the analysis of a sample, the results should be flagged as estimated low and the project contact should be notified immediately.

5. All samples must be held sealed 40-mL vials at 4°C and analyzed within the holding times. During storage, all conditions relating to the isolation/segregation of the samples from potential sources of volatile compound cross-contamination must be observed.

    a. Unpreserved samples in sealed vials can be stored at 4°C for 7 days with subsequent freezing at –12°C for up to 14 days from the date of sample collection.

    b. Sample preserved with sodium bisulfate or methanol can be held at 4°C for 14 days from the date of collection.

    c. The laboratory should make every effort in order to perform any reanalysis within the applicable holding time.

    d. It is recommended storage blanks be used to monitor cross-contamination.

6. For the low-level option, all reagents (water, internal standards, etc.) must be introduced into the sample vial so that the air displaced as a result of the additions is trapped as part of the analysis. The addition of reagents can be made using a gas-tight syringe with a 22 gauge or thinner needle.

7. The sample must be agitated during the purging process of low concentration soils.

8. For the high-level option, the test to determine the solvent to use should be performed on the bulk sample. The appropriate solvent should be added to the vial, and the sample should be analyzed or stored at 4°C and analyzed with 14 days of sample collection.

9. Oily waste samples should be processed following the prescribed procedures for sample collection, preparation, and analysis in Method 5035 (section 6.2.4).

10. Field quality control measures should include a trip blank in every sample shuttle that include samples for volatile analysis regardless of the sample collection technique. Field blanks and field duplicates will be submitted as specified in the project plan.

11. The laboratory must report the method of preservation and preparation on the analytical results sheet or case narrative.

TABLE A-5 Method SW8270C-Semivolatile Organics

Semivolatile organics (also known as base/neutral and acid extractables) in water and soil samples are analyzed using method SW8270C. This technique determines quantitatively the concentration of a number of SVOCs. Samples are extracted and both base/neutral and acid extracts are then concentrated through evaporation. Compounds of interest are separated and quantified using a capillary column GC/mass spectrometer. The RLs are listed in the following tables.

The mass spectrometer is tuned every 12 hours to give an acceptable spectrum for decafluorotriphenylphosphine (DFTPP). The tuning acceptance criteria are given in the following list as an ion abundance for each specified mass:

- mass 51 30 percent to 60 percent of mass 198
- mass 68 less than 2 percent of mass 69
- mass 70 less than 2 percent of mass 69
- mass 127 40 percent to 60 percent of mass 198
- mass 197 less than 1 percent of mass 198
- mass 198 base peak, 100 percent relative abundance
- mass 199 5 percent to 9 percent of mass 198
- mass 275 10 percent to 30 percent of mass 198
- mass 365 greater than 1 percent of mass 198
- mass 441 present, but less than mass 443
- mass 442 greater than 40 percent of mass 198
- mass 443 17 percent to 23 percent of mass 442

The IS method is used for quantitation of analytes of interest. For quantitation, RFs are calculated from the base ion peak of a specific IS that is added to each calibration standard, blank, QC sample, and sample. The calibration, QC, corrective action, and data flagging requirements are given in the following tables.

TABLE A-5.A
RLs for Method SW8270C

		Water		Soil	
Parameter/Method	Analyte	RL	Unit	RL	Unit
Semivolatile organics	1,2,4-Trichlorobenzene	10.0	µg/L	330	µg/kg
Base/Neutral Extractables	1,2-Dichlorobenzene	10.0	µg/L	330	µg/kg
SW8270C	1,3-Dichlorobenzene	10.0	µg/L	330	µg/kg
	1,4-Dichlorobenzene	10.0	µg/L	330	µg/kg
	2,4-Dinitrotoluene	10.0	µg/L	330	µg/kg
	2,6-Dinitrotoluene	10.0	µg/L	330	µg/kg
	2-Chloronaphthalene	10.0	µg/L	330	µg/kg
	2-Methylnaphthalene	10.0	µg/L	330	µg/kg

Parameter/Method	Analyte	Water RL	Water Unit	Soil RL	Soil Unit
	2-Nitroaniline	25.0	µg/L	830	µg/kg
Semivolatile organics	3-Nitroaniline	25.0	µg/L	830	µg/kg
Base/Neutral Extractables	3,3'-Dichlorobenzidine	10.0	µg/L	330	µg/kg
SW8270C	4-Bromophenyl phenyl ether	10.0	µg/L	330	µg/kg
(continued)	4-Chloroaniline	10.0	µg/L	330	µg/kg
	4-Nitroaniline	25.0	µg/L	830	µg/kg
	Acenaphthylene	10.0	µg/L	330	µg/kg
	Acenapthene	10.0	µg/L	330	µg/kg
	Anthracene	10.0	µg/L	330	µg/kg
	Benz (a) anthracene	10.0	µg/L	330	µg/kg
	Benzo (a) pyrene	10.0	µg/L	330	µg/kg
	Benzo (b) fluoranthene	10.0	µg/L	330	µg/kg
	Benzo (k) fluoranthene	10.0	µg/L	330	µg/kg
	Benzo (g,h,i) perylene	10.0	µg/L	330	µg/kg
	Bis (2-chloroethoxy) methane	10.0	µg/L	330	µg/kg
	Bis (2-chlorethyl) ether	10.0	µg/L	330	µg/kg
	4-chlorophenyl phenyl ether	10.0	µg/L	330	µg/kg
	Bis (2-ethylhexyl) phthalate	10.0	µg/L	330	µg/kg
	Butyl benzylphthalate	6.0	µg/L	330	µg/kg
	Carbazole	10.0	µg/L	330	µg/kg
	Chrysene	10.0	µg/L	330	µg/kg
	Di-n-butylphthalate	10.0	µg/L	330	µg/kg
	Di-n-octylphthalate	10.0	µg/L	330	µg/kg
	Dibenz (a,h) anthracene	10.0	µg/L	330	µg/kg
	Dibenzofuran	10.0	µg/L	330	µg/kg
	Diethyl phthalate	10.0	µg/L	330	µg/kg
	Dimethly phthalate	10.0	µg/L	330	µg/kg
	Fluoranthene	10.0	µg/L	330	µg/kg
	Fluorene	10.0	µg/L	330	µg/kg
	Hexachlorobenzene	10.0	µg/L	330	µg/kg
	Hexachlorobutadiene	10.0	µg/L	330	µg/kg
	Hexachlorocyclopentadiene	10.0	µg/L	330	µg/kg
	Hexachloroethane	10.0	µg/L	330	µg/kg
	Indeno (1,2,3-cd) pyrene	10.0	µg/L	330	µg/kg
	Isophorone	10.0	µg/L	330	µg/kg
	n-Nitrosodiphenylamine	10.0	µg/L	330	µg/kg
	n-Nitrosodi-n-propylamine	10.0	µg/L	330	µg/kg
	Naphthalene	10.0	µg/L	330	µg/kg
	Nitrobenzene	10.0	µg/L	330	µg/kg

Parameter/Method	Analyte	Water RL	Water Unit	Soil RL	Soil Unit
	Phenanthrene	10.0	µg/L	330	µg/kg
Semivolatile organics	Pyrene	10.0	µg/L	330	µg/kg
	2,2'-oxybis(1-chloroprpane)	10.0	µg/L	330	µg/kg
Acid Extractables	2,4,5-Trichlorophenol	25.0	µg/L	830	µg/kg
SW8270C	2,4,6-Trichlorophenol	10.0	µg/L	330	µg/kg
(Continued)	2,4-Dichlorophenol	10.0	µg/L	330	µg/kg
	2,4-Dimethylphenol	10.0	µg/L	330	µg/kg
	2,4-Dinitrophenol	25.0	µg/L	830	µg/kg
	2-Chlorophenol	10.0	µg/L	330	µg/kg
	2-Methylphenol	10.0	µg/L	330	µg/kg
	2-Nitrophenol	10.0	µg/L	330	µg/kg
	4-Nitrophenol	10.0	µg/L	330	µg/kg
	4,6-Dinitro-2-methylphenol	25.0	µg/L	830	µg/kg
	4-Chloro-3-methylphenol	10.0	µg/L	330	µg/kg
	4-Methylphenol	10.0	µg/L	330	µg/kg
	Pentachlorophenol	10.0	µg/L	330	µg/kg
	Phenol	10.0	µg/L	330	µg/kg

TABLE A-5.B
QC Acceptance Criteria for Method SW8270C

Method	Analyte	Accuracy Water (% R)	Precision Water (% RPD)	Accuracy Soil (% R)	Precision Soil (% RPD)	Assoc. IS
SW8270C	1,2,4-Trichlorobenzene	44–142	≤ 20	34–152	≤ 30	2
	1,2-Dichlorobenzene	42–155	≤ 20	32–135	≤ 30	1
	1,3-Dichlorobenzene	36–125	≤ 20	26–135	≤ 30	1
	1,4-Dichlorobenzene	30–125	≤ 20	25–135	≤ 30	1
	Bis (2-chloroisopropyl) ether	36–166	≤ 20	26–175	≤ 30	1
	2,4,5-Trichlorophenol	25–175	≤ 20	25–175	≤ 30	3
	2,4,6-Trichlorophenol	39–128	≤ 20	29–138	≤ 30	3
	2,4-Dichlorophenol	46–125	≤ 20	36–135	≤ 30	2
	2,4-Dimethylphenol	45–139	≤ 20	35–149	≤ 30	2
	2,4-Dinitrophenol	30–151	≤ 20	25–161	≤ 30	3
	2,4-Dinitrotoluene	39–139	≤ 20	29–149	≤ 30	3
	2,6-Dinitrotoluene	51–125	≤ 20	41–135	≤ 30	3
	2-Chloronaphthalene	60–125	≤ 20	50–135	≤ 30	3
	2-Chlorophenol	41–125	≤ 20	31–135	≤ 30	1
	2-Methylnaphthalene	41–125	≤ 20	31–135	≤ 30	2

Method	Analyte	Accuracy Water (% R)	Precision Water (% RPD)	Accuracy Soil (% R)	Precision Soil (% RPD)	Assoc. IS
	2-Methylphenol	25–125	≤ 20	25–135	≤ 30	1
	4-Nitrophenol	25-131	≤ 20	25-141	≤ 30	3
	2-Nitroaniline	50–125	≤ 20	40–135	≤ 30	3
	2-Nitrophenol	44–125	≤ 20	34–135	≤ 30	2
	3,3'-Dichlorobenzidine	29–175	≤ 20	25–175	≤ 30	5
	3-Nitroaniline	51–125	≤ 20	41–135	≤ 30	3
	4,6-Dinitro-2-Methyl Phenol	26–134	≤ 20	25–144	≤ 30	4
	4-Bromophenyl phenyl ether	53–127	≤ 20	43–137	≤ 30	4
	4-Chloro-3-Methyl Phenol	44–125	≤ 20	34–135	≤ 30	2
	4-Chloroaniline	45-136	≤ 20	35-146	≤ 30	2
	4-Methylphenol	33–125	≤ 20	25–135	≤ 30	1
	4-Nitroaniline	40–143	≤ 20	30–153	≤ 30	3
	Acenaphthene	49–125	≤ 20	39–135	≤ 30	3
	Acenaphthylene	47–125	≤ 20	37–135	≤ 30	3
	Anthracene	45–165	≤ 20	35–175	≤ 30	4
	Benz (a) anthracene	51–133	≤ 20	41–143	≤ 30	5
	Benzo (a) pyrene	41–125	≤ 20	31–135	≤ 30	6
	Benzo (b) fluoranthene	37–125	≤ 20	27–1 35	≤ 30	6
	Benzo (g,h,i) perylene	34–149	≤ 20	25–159	≤ 30	6
	Benzo (k) fluoranthene	45-126	≤ 20	46-114	≤ 30	
	Bis (2-chloroethoxy) methane	49–125	≤ 20	39–135	≤ 30	2
	Bis (2-chloroethyl) ether	44–125	≤ 20	34–135	≤ 30	1
	4-chlorophenyl phenyl ether	51-132	≤ 20	41-142	≤ 30	3
	Bis (2-ethylhexyl) phthalate	33–129	≤ 20	25–139	≤ 30	5
	Butyl benzyl phthalate	26–125	≤ 20	25–135	≤ 30	5
	Carbazole	19-177	≤ 20	28-149	≤ 30	
	Chrysene	55–133	≤ 20	45–143	≤ 30	5
	Dibenz (a,h) anthracene	50–125	≤ 20	40–135	≤ 30	6
	Dibenzofuran	52–125	≤ 20	42–135	≤ 30	3
	Diethyl phthalate	37–125	≤ 20	27–135	≤ 30	3
	Dimethyl phthalate	25–175	≤ 20	25–175	≤ 30	3
	Di-n-butyl phthalate	34–126	≤ 20	25–136	≤ 30	4
	Di-n-octyl phthalate	38–127	≤ 20	28–137	≤ 30	5
	Fluoranthene	47–125	≤ 20	37–135	≤ 30	4

Method	Analyte	Accuracy Water (% R)	Precision Water (% RPD)	Accuracy Soil (% R)	Precision Soil (% RPD)	Assoc. IS
	Fluorene	48–139	≤ 20	38–149	≤ 30	3
	Hexachlorobenzene	46–133	≤ 20	36–143	≤ 30	4
	Hexachlorobutadiene	25–125	≤ 20	25–135	≤ 30	2
	Hexachlorocyclopentadiene	41–125	≤ 20	31–135	≤ 30	3
	Hexachloroethane	25–153	≤ 20	25–163	≤ 30	1
	Indeno (1,2,3-c,d) pyrene	27–160	≤ 20	25–170	≤ 30	5
	Isophorone	26–175	≤ 20	25–175	≤ 30	2
	Naphthalene	50–125	≤ 20	40–135	≤ 30	2
	Nitrobenzene	46–133	≤ 20	36–143	≤ 30	2
	n-Nitrosodi-n-propylamine	37–125	≤ 20	27–135	≤ 30	1
	n-Nitrosodiphenylamine	27–125	≤ 20	25–135	≤ 30	4
	Pentachlorophenol	28–136	≤ 20	38–146	≤ 30	4
	Phenanthrene	54–125	≤ 20	44–135	≤ 30	4
	Phenol	25–125	≤ 20	25–135	≤ 30	1
	Pyrene	47–136	≤ 20	37–146	≤ 30	5
	Surrogates:					
	2,4,6-Tribromophenol	25–134		25–144		1
	2-Fluorobiphenyl	43–125		34–135		2
	2-Fluorophenol	25–125		25–135		3
	Nitrobenzene-D5	32–125		25–135		4
	Phenol-D5	25–125		25–135		5
	Terphenyl-D14	42–126		32–136		6
	Internal Standards:					
	1,4-Dichlorobenzene-D4					1
	Naphthalene-D8					2
	Acenaphthalene-D8					3
	Phenanthrene-D10					4
	Chrysene-D12					5
	Perylene-D12					6

TABLE A-5.C
Summary of Calibration and QC Procedures for Method SW8270C

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
SW8270C	Semi Volatile Organics	Five-point initial calibration for all analytes	Initial calibration prior to sample analysis	Initial cal. Stds. RRF ≥ 0.05. SPCCs average RF ≥ 0.050 and %RSD for RFs for CCCs ≤ 30% and one option below *option 1 linear-* mean RSD for all analytes ≤15% with no individual analyte RSD >30% RF > 0.05 *Option 2 linear* – least squares regression r ≥ 0.99 *Option 3 non-linear* – COD ≥ 0.990 (6 points shall be used for second order, 7 points shall be used for third order)	Correct problem then repeat initial calibration	If ≥ 30%, and ICS RRF ≥ 0.05, J flag positive results. If ICS RRF <0.05, J flag positive results, and R flag non-detects.
		Retention time window calculated for each analyte	Each sample	Relative retention time (RRT) of the analyte within ± 0.06 RRT units of the RRT	Correct problem then reanalyze all samples analyzed since the last retention time check	Apply R to all results for the specific analyte(s) in the sample
		Calibration verification	Daily, before sample analysis and every 12 hours of analysis time	SPCCs average RF ≥ 0.050; and CCCs ≤ 20% difference (when using RFs)or drift (when using least squares regression or non-linear calibration) All calibration analytes within ±30% of expected value	Correct problem then repeat initial calibration	Apply R to all results for all samples associated with the calibration verification Apply J to all positive results and UJ to non-detects for all results for specific analyte(s) for all samples associated with the calibration verification
		Demonstrate ability to generate acceptable accuracy and precision using four replicate analyzes of a QC check sample	Once per analyst	QC acceptance criteria in table.	Recalculate results; locate and fix problem with system and then rerun demonstration for those analytes that did not meet criteria	Apply R to all results for all samples analyzed by the analyst

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
SW8270C	Semi Volatile Organics	ISs	Immediately after or during data acquisition for each sample	Retention time ±30 seconds from retention time of the mid-point std. In the ICAL. EICP area within -50% to +100% of ICAL mid-point std.	Inspect mass spectrometer and GC for malfunctions; mandatory reanalysis of samples analyzed while system was malfunctioning	Apply J to positive results. If IS area <50%, UJ non-detects. If IS area <10%, R flag non-detects.
		Method blank	One per analytical batch (every 20 samples)	No analytes detected ≥ RL	Correct problem then reprep and analyze method blank and all samples processed with the contaminated blank	Apply U to all results for the specific analyte(s) in all samples in the associated analytical batch whose concentration is less than 5 times blank concentration.
		LCS	One LCS per analytical batch	QC acceptance criteria in table	Correct problem then reprep and analyze the LCS and all samples in the affected analytical batch	Flags applied in conjunction with performance of surrogates, internal stds, LCS, and MS/MSD
		MS/MSD	One MS/MSD per every 40 samples.	QC acceptance criteria in table.	none	Flags applied in conjunction with performance of surrogates, internal stds, LCS, and MS/MSD
		Check of mass spectral ion intensities using DFTPP	Prior to initial calibration and calibration verification	Refer to criteria listed in the method description	Retune instrument and verify	Apply R to all results for all samples associated with the tune
		Surrogate spike	Every sample, spiked sample, standard, and method blank	QC acceptance criteria in table.	Correct problem then reextract and analyze sample	If the %R > UCL for a surrogate, apply J to all positive results if the %R < LCL for a surrogate, apply J to all positive results; apply UJ to all non-detect results. If any surrogate recovery is <10%, J flag positive results and R flag non-detects. Note: only the compounds in the corresponding fraction should be flagged. For example, if only acid surrogate

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
						recoveries are low, then only the acidic compounds should be flagged.
		MDL study	Once per 12 month period	Detection limits established shall be ≤ ½ the RLs in table.	none	Apply R to all results for the specific analyte(s) in all samples analyzed
		Results reported between MDL and RL	none	None	none	Apply J to all results between MDL and RL
		Report TICs as required	Report TICs for largest peaks (10 for VOC, 20 for SVOC) which have area or height > 10% of area or height of nearest IS. TICs concentrations estimated by using RRF of 1.0	Relative intensities of major ions in reference spectrum should be present in sample spectrum and relative intensities should agree ± 20%		All TIC results should be qualified "J", tentatively identified, with approximated concentrations If tentative identification not accurate, uncertain, or extenuating factors affect ID, peak should be identified as "unknown" or as appropriate identification
						If TIC not in blank, but suspected artifact of common lab contaminant (or aldol condensation product, solvent preservative, reagent contaminant), flag result as unusable ("R")
						If lack of isomer specificity, TIC result should be changed to nonspecific isomer
						If more than one possible match, result may be reported as "either compound X or Y"
						Similar compounds may be reported as total (example "alkanes")

a. All corrective actions associated with project work shall be documented, and the laboratory shall maintain all records.
b. Flagging criteria are applied when acceptance criteria were not met and corrective action was not successful or corrective action was not performed.

Table A-6 Method SW8310–Polynuclear Aromatic Hydrocarbons

Method SW8310 is used to determine the concentration of ppb levels of selected polynuclear aromatic hydrocarbons (PAHs) in groundwater and soils by HPLC. Samples are extracted then analyzed by direct injection. Detection is by ultraviolet and fluorescent detectors. RLs are listed in the following table. The calibration, QC, corrective action, and data flagging requirements are given in the following tables.

TABLE A-6.A
RLs for Method SW8310

		Water		Soil	
Parameter/Method	**Analyte**	**RL**	**Unit**	**RL**	**Unit**
Polynuclear Aromatic	Acenaphthene	18.0	µg/L	1.2	mg/kg
Hydrocarbons	Acenaphthylene	23.0	µg/L	1.54	mg/kg
SW8310	Anthracene	6.6	µg/L	0.44	mg/kg
	Benzo (a) anthracene	0.13	µg/L	0.009	mg/kg
	Benzo (a) pyrene	0.2	µg/L	0.015	mg/kg
	Benzo (b) fluoranthene	0.18	µg/L	0.012	mg/kg
	Benzo (g,h,i) perylene	0.76	µg/L	0.05	mg/kg
	Benzo (k) fluoranthene	0.17	µg/L	0.011	mg/kg
	Chrysene	1.5	µg/L	0.1	mg/kg
	Dibenzo (a,h) anthracene	0.3	µg/L	0.02	mg/kg
	Fluoranthrene	2.1	µg/L	0.14	mg/kg
	Fluorene	2.1	µg/L	0.14	mg/kg
	Indeno (1,2,3-c,d) pyrene	0.43	µg/L	0.03	mg/kg
	Naphthalene	18.0	µg/L	1.2	mg/kg
	Phenanthrene	6.4	µg/L	0.42	mg/kg
	Pyrene	2.7	µg/L	0.18	mg/kg

TABLE A-6.B
QC Acceptance Criteria for Method SW8310

Method	**Analyte**	**Accuracy Water (% R)**	**Precision Water (% RPD)**	**Accuracy Soil (% R)**	**Precision Soil (% RPD)**
SW8310	Acenaphthene	43–130	≤ 30	33–140	≤ 50
	Acenaphthylene	49–125	≤ 30	39–135	≤ 50
	Anthracene	54–125	≤ 30	44–135	≤ 50
	Benzo (a) Anthracene	39–135	≤ 30	29–145	≤ 50
	Benzo (a) Pyrene	52–125	≤ 30	42–135	≤ 50
	Benzo (b) Fluoranthene	31–137	≤ 30	25–147	≤ 50
	Benzo (g,h,i) Perylene	53–125	≤ 30	43–135	≤ 50
	Benzo (k) Fluoranthene	60–129	≤ 30	50–139	≤ 50

Method	Analyte	Accuracy Water (% R)	Precision Water (% RPD)	Accuracy Soil (% R)	Precision Soil (% RPD)
	Chrysene	59–134	≤ 30	49–144	≤ 50
	Dibenzo (a,h) Anthracene	51–125	≤ 30	41–135	≤ 50
	Fluoranthene	42–125	≤ 30	32–135	≤ 50
	Fluorene	53–125	≤ 30	43–135	≤ 50
	Indeno (1,2,3-c,d) Pyrene	55–125	≤ 30	45–135	≤ 50
	Naphthalene	43–125	≤ 30	33–135	≤ 50
	Phenathrene	52–129	≤ 30	42–139	≤ 50
	Pyrene	55–125	≤ 30	45–135	≤ 50
	Surrogates:				
	Terphenyl-D14	25–157		22–167	

TABLE A-6.C
Summary of Calibration and QC Procedures for Method SW8310

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
SW8310	PAHs	Five-point initial calibration for all analytes	Initial calibration prior to sample analysis	Linear - mean RSD of average CF of all analytes ≤20% and average CF of individual analyte <30%, or mean RSD for all analytes ≤20% with no individual analyte RSD > 30% Linear – least squares regression r ≥ 0.99 Non-linear – COD ≥ 0.990 (6 points shall be used for second order, 7 points shall be used for third order)	Correct problem then repeat initial calibration	Apply J to positive results and UJ to non-detects for specific analyte(s) for all samples associated with the calibration
		Retention time window calculated for each analyte	Each initial calibration and calibration verifications	± 3 times standard deviation for each analyte retention time from 72-hour study	Correct problem then reanalyze all samples analyzed since the last retention time check	Apply R to all results for the specific analyte(s) in the sample
		Initial calibration verification	Daily, before sample analysis	All analytes within ±15% of expected value	Correct problem then repeat initial calibration	Apply J to all results and UJ to non-detects for all results for specific analyte(s) for all samples associated with the calibration
		Calibration verification	After every 10 samples and at the end of the analysis	All analytes within ±15% of expected value. However, if the std analyzed	Correct problem then repeat initial calibration verification and	Apply J to all positive results and UJ to non-detects for all

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
			sequence	after a group of samples exhibits a response for an analyte that is above the acceptance limit, i.e., >15%, and the analyte was not detected in any of the previous samples during the analytical shift, then the sample extracts do not need to be reanalyzed, as the CCV std has demonstrated that the analyte would have been detected were it present.	reanalyze all samples since last successful calibration verification	results for the specific analyte(s) in all samples since the last acceptable calibration verification
SW8310	PAHs					
		Method blank	One per analytical batch	No analytes detected ≥ RL	Correct problem then reprep and analyze method blank and all samples processed with the contaminated blank	Apply U to all results for the specific analyte(s) in all samples in the associated analytical batch whose concentration is less than 5 times the blank concentration.
		LCS for all analytes	One LCS per analytical batch	QC acceptance criteria in table.	Correct problem then reprep and analyze the LCS and all samples in the affected analytical batch	
		Surrogate spike	Every sample, spiked sample, standard, and method blank	QC acceptance criteria in table.	Correct problem then reextract and analyze sample	For the samples; if the %R > UCL for any surrogate, apply J to all positive results if the %R < LCL for any surrogate, apply J to all positive results, apply UJ to all non-detects If any surrogate recovery is < 10%, J flags positive results, and R flag non-detects.
SW8310	PAHs	MS/MSD	One MS/MSD per every 40 samples.	QC acceptance criteria in table.	none	None
		Confirmation[c]	100% for all positive results for unfamiliar	Same as for initial or primary analysis	Same as for initial or primary analysis	Apply R to the result for the specific analyte(s)

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
			samples. Note:Confirmation may not be necessary if pesticide is known to be present based on prior analyses established by prior analyses			in the sample not confirmed. Apply J if RPD >40% from first result
		MDL study	Once per 12 month period	Detection limits established shall be ≤ ½ the RLs in table.	none	Apply R to all results for the specific analyte(s) in all samples analyzed
		Results reported between MDL and RL	None	None	none	Apply J to all results between MDL and RL

a. All corrective actions associated with project work shall be documented, and the laboratory shall maintain all records.
b. Flagging criteria are applied when acceptance criteria were not met and corrective action was not successful or corrective action was not performed.
c. Use a second column or different detector

TABLE A-7 TX1005/TX1006-Total Petroleum Hydrocarbons

This method involves extraction of a soil with methanol and n-pentane or a water sample with n-pentane, and analysis of a portion of the extract using gas chromatography with a flame ionization detector. Reporting limits (RLs) for this method are presented in the following table. The calibration, QC, corrective action, and data flagging requirements are given in the following tables.

TABLE A-7.A
RLs for Method TX1005

		Water		Soil	
Parameter/Method	Analyte	RL	Unit	RL	Unit
TPH/TX1005/TX1006					
	Gasoline Range (C6-C10)	5	mg/L	50	mg/kg
	Diesel Range (>C10-C28)	5	mg/L	50	mg/kg

TABLE A-7.B
QC Acceptance Criteria for Method TX1005

Method	Analyte	Accuracy Water (% R)	Precision Water (% RPD)	Accuracy Soil (% R)	Precision Soil (% RPD)
TX1005/TX1006					
	Gasoline Range (C6-C10)	70-130	≤ 30	70-130	≤ 30
	Diesel Range (>C10-C28)	70-130	≤ 30	70-130	≤ 30

TABLE A-7.C
Summary of Calibration and QC Procedures for Method TX1005

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Actiona	Flagging Criteriab
TX1005 TX1006	TPH	Five-point initial calibration (mixture of gasoline and diesel)	Initial calibration prior to sample analysis	linear - mean RSD for all analytes ≤25%	Correct problem then repeat initial calibration	Apply J to positive results and UJ to non-detects for specific analyte(s) for all samples associated with the calibration
				linear – least squares regression r ≥ 0.995		
		Retention time window calculated for the window defining compounds (minimally C6,	Each initial calibration and once every day samples are analyzed	± 3 times standard deviation for each analyte retention time from 72-hour	Correct problem then reanalyze all samples analyzed since the last retention time check	Apply R to all results for the specific analyte(s) in the sample

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Actiona	Flagging Criteriab
		C10, C28)		study		
		Initial calibration verification	Daily, before sample analysis	All analytes within ±25% of expected value	Correct problem then repeat initial calibration	Apply J to all positive results and UJ to non-detects for all results for specific analyte(s) for all samples associated with the calibration
		Calibration verification	After every 10 samples and at the end of the analysis sequence	All analytes within ±25% of expected value	Correct problem then repeat initial calibration verification and reanalyze all samples since last successful calibration verification	Apply J to all positive results and UJ to non-detects for all results for the specific analyte(s) in all samples since the last acceptable calibration verification
TX1005	TPH					
		Method blank	One per analytical batch (every 20 samples)	< RL	Correct problem then reprep and analyze method blank and all samples processed with the contaminated blank	Apply U to all results for the specific analyte(s) in all samples in the associated analytical batch whose concentration is less than 5 times blank concentration.
		LCS for analytes listed in table.	One LCS per analytical batch (every 20 samples)	QC acceptance criteria in table.	Correct problem then reprep and analyze the LCS and all samples in the affected analytical batch	For specific analyte(s) in all samples in the associated analytical batch; if the LCS %R > UCL, apply J to all positive results if the LCS %R < LCL, apply J to all positive results, apply UJ to all non-detects if LCS <10%, R flag results
TX1005	TPH					
		MS/MSD	One MS/MSD per every 40.	QC acceptance criteria in table.	none	none
		MDL study	Once per 12 month period	Detection limits established shall be ≤ ½ the RLs in table.	none	Apply R to all results for the specific analyte(s) in all samples analyzed
		Results reported	None	none	none	Apply J to all results between

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Actiona	Flagging Criteriab
		between MDL and RL				MDL and RL

a. All corrective actions associated with project work shall be documented, and the laboratory shall maintain all records.

b. Flagging criteria are applied when acceptance criteria were not met and corrective action was not successful or corrective action was not performed.

TABLE A-8 Method SW9010B/SW9012A - Total Cyanide and Cyanide Amenable to Chlorination

Water and waste samples are analyzed for total cyanide using method SW9010B or SW9012A. These methods are equivalent in principle of analysis; SW9010B is a manual procedure, and SW9012A is an automated procedure.

Both methods are used to determine the concentration of inorganic cyanide in soils, aqueous wastes and leachates. The methods detect inorganic cyanides that are present as either sample soluble salts or complex radicals. It is used to determine values for both total cyanide and cyanide amenable to chlorination. The cyanide is released by refluxing the sample with a strong acid catalyst and distillation. Total cyanide in soils is determined after acidification of the soil and distillation. The cyanide ion in the basic absorbing solution is then determined by colorimetry for methods SW9010B and SW9012A. RLs for cyanide are listed in the following table. The calibration, QC, corrective action, and data flagging requirements are given in the following tables.

TABLE A-8.A
RLs for Method SW9010B/SW9012A

Parameter/Method	Analyte	RL	Unit
SW9010B/SW9012A	Total cyanide (Water)	10	µg/L
	Total cyanide (Soil)	0.5	mg/kg

TABLE A-8.B
QC Acceptance Criteria for Method SW9010B/SW9012A

Method	Analyte	Accuracy Water/Soil (% R)	Precision Water/Soil (% RPD)
SW9010B SW9012A	Total cyanide	75–125	≤ 20 waters; ≤ 35 soils

TABLE A-8.C
Summary of Calibration and QC Procedures for Method SW9010B/SW9012A

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
SW9010B/ SW9012A	Cyanide	Multipoint calibration curve (six standards and a calibration blank)	Initial daily calibration prior to sample analysis	Correlation coefficient ≥0.995 for linear regression	Correct problem then repeat initial calibration	Apply R to the result for cyanide for all samples associated with the calibration
		Distilled standards (one	Once per multipoint	Cyanide within ±10% of true	Correct problem then repeat	Apply J to positive results and UJ to

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
		high and one low)	calibration	value	distilled standards	non-detects for the specific analyte for all samples associated with the calibration
		Calibration verification (Instrument Check Standard – ICV and CCV)	Immediately after calibration and after every 10 samples and at the end of the analysis sequence	All analyte(s) within ±15% of expected value	Repeat calibration and reanalyze all samples since last successful calibration	Apply J to positive results and UJ to non-detects for the specific analyte(s) in all samples since the last acceptable calibration
		Method blank	One per analytical batch or one per every twenty samples, whichever is most frequent	No analytes detected ≥ RL	Correct problem then reprep and analyze method blank and all samples processed with the contaminated blank	Apply U to the result for the specific analyte in all samples in the associated analytical batch whose concentration is less than 5 times blank concentration
SW9010B/ SW9012A	Cyanide	LCS for all analytes	One LCS per analytical batch	The laboratory should use control chart limits at 3 standard deviations; if not available 80-120% shall be used	Correct problem then reprep and analyze the LCS and all samples in the affected AFCEE analytical batch	For the specific analyte in all samples in the associated analytical batch; if the LCS %R > UCL, apply J to all positive results if the LCS %R < LCL, apply J to all positive results, apply UJ to all non-detects if LCS <10%, R flag results
SW9010B/ SW9012A	Cyanide	MS/MSD	One MS/MSD per every 40 samples	QC acceptance criteria in table	none	If recovery is greater than 125%, J all detects; if less than 75%, but greater than 30%, J all detects and UJ non-detects; If less than 30%, R all non-detects and J all detects; If the RPD of the MSD is outside 20, flag detects as J and non-

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
						detects as UJ
		MDL study	Once per 12 month period	Detection limits established shall be ≤ ½ the RLs in table	none	Apply R to all results for the specific analyte in all samples analyzed
		Results reported between MDL and RL	none	none	none	Apply J to all results between MDL and RL

a. All corrective actions associated with project work shall be documented, and the laboratory shall maintain all records.
b. Flagging criteria are applied when acceptance criteria were not met and corrective action was not successful or corrective action was not performed.

A-9 Method SW6010B - Trace Elements (Metals) by Inductively Coupled Plasma Emission Spectroscopy (ICPES) for Water and Soil

Samples are analyzed for trace elements using method SW6010B for water and soils. Analysis requires digestion of the sample. Following digestion, the trace elements are determined simultaneously or sequentially using the ICPES technique. Axial or radial view plasmas are acceptable in this method. The elements and corresponding RLs for this method are listed in the following table. The calibration, QC, corrective action, and data flagging requirements are given in the following tables.

TABLE A-9.A
RLs for Method SW6010B

Parameter/Method	Analyte	Water RL	Water Unit	Soil RL	Soil Unit
ICP Screen for Metals					
SW6010B	Antimony (a)	6	µg/L	1.2	mg/kg
	Arsenic (a)	5	µg/L	1.0	mg/kg
	Barium	5.0	µg/L	1.0	mg/kg
	Beryllium	2.0	µg/L	0.4	mg/kg
	Cadmium	5.0	µg/L	1.0	mg/kg
	Calcium	500	µg/L	100	mg/kg
	Chromium	8.0	µg/L	1.6	mg/kg
	Cobalt	10.0	µg/L	2.0	mg/kg
	Copper	5.0	µg/L	1.0	mg/kg
	Iron	100	µg/L	20	mg/kg
	Lead (a)	5.0	µg/L	1.0	mg/kg
	Magnesium	100	µg/L	40	mg/kg
	Manganese	5.0	µg/L	1.0	mg/kg
	Nickel	20	µg/L	4.0	mg/kg
	Potassium	2000	µg/L	400	mg/kg
	Selenium (a)	5.0	µg/L	1.0	mg/kg
	Vanadium	10	µg/L	2.0	mg/kg
	Silver	10	µg/L	2.0	mg/kg
	Zinc	10	µg/L	2.0	mg/kg

(a) These metals should be reported by their respective SW846/7000 series methods in Section A-10 unless the required reporting limits can be met by Method 6010B using a trace ICP instrument.

TABLE A-9.B
Matrix Precision and Accuracy Acceptance Criteria for Method SW6010B

Method	Analyte	Accuracy Water (% R)	Precision Water (% RPD)	Accuracy Soil (% R)	Precision Soil (% RPD)
SW6010B					
	Antimony (a)	75-125	≤ 20	75-125	≤ 35
	Arsenic (a)	75-125	≤ 20	75-125	≤ 35
	Barium	75-125	≤ 20	75-125	≤ 35
	Beryllium	75-125	≤ 20	75-125	≤ 35
	Cadmium	75-125	≤ 20	75-125	≤ 35
	Calcium	75-125	≤ 20	75-125	≤ 35
	Chromium	75-125	≤ 20	75-125	≤ 35
	Cobalt	75-125	≤ 20	75-125	≤ 35
	Copper	75-125	≤ 20	75-125	≤ 35
	Iron	75-125	≤ 20	75-125	≤ 35
	Lead (a)	75-125	≤ 20	75-125	≤ 35
	Magnesium	75-125	≤ 20	75-125	≤ 35
	Manganese	75-125	≤ 20	75-125	≤ 35
	Nickel	75-125	≤ 20	75-125	≤ 35
	Potassium	75-125	≤ 20	75-125	≤ 35
	Selenium (a)	75-125	≤ 20	75-125	≤ 35
	Silver	75-125	≤ 20	75-125	≤ 35
	Vanadium	75-125	≤ 20	75-125	≤ 35
	Zinc	75-125	≤ 20	75-125	≤ 35

(a) These metals should be reported by their respective SW846/7000 series methods in Section A.10 unless the required reporting limits can be met by Method 6010B using a trace ICP instrument.

TABLE A-9.C
Summary of Calibration and QC Procedures for Method SW6010B

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
SW6010B	ICP Metals	Initial calibration (minimum 1 standard and a blank)	Daily initial calibration prior to sample analysis	N/A	N/A	Apply R to all results for specific analyte(s) for all samples associated with the calibration if calibration not done
		Initial and continuing calibration blank	After every calibration verification (ICV and CCV)	No analytes detected ≥ RL	Correct problem then analyze calibration blank and previous 10 samples	Apply U to all results for specific analyte(s) in all samples associated with the blank that are less than 5 times blank concentration
		Calibration verification (Instrument Check Standard – ICV and CCV)	Immediately after calibration and after every 10 samples and at the end of the analysis sequence	All analyte(s) within ±10% of expected value and RSD of replicate integrations <5%	Repeat calibration and reanalyze all samples since last successful calibration	Apply J to positive results and UJ to non-detects for the specific analyte(s) in all samples since the last acceptable calibration
SW6010B	ICP Metals	Method blank	One per analytical batch	No analytes detected ≥ RL	Correct problem then reprep and analyze method blank and all samples processed with the contaminated blank	Apply U to all results for the specific analyte(s) in all samples in the associated analytical batch that are less than 5 times blank concentration
		Interference check solution (ICS)	At the beginning of an analytical run	Within ±20% of expected value	Terminate analysis; correct problem; reanalyze ICS; reanalyze all affected samples	If ICS >120%, J flag positive results. If 50-79%, J flag positive results, and UJ flag non-detects. If ICS <50%, R flag results.
		LCS for the analyte	One LCS per analytical batch for method accuracy	The laboratory should use control chart limits at 3 standard deviations; if not available 80-120% shall be used	Correct problem then reprep and analyze the LCS and all samples in the affected analytical batch	For specific analyte(s) in all samples in the associated analytical batch; if the LCS %R > UCL, apply J to all positive results if the LCS %R < LCL, apply J to all positive results, apply UJ to all non-detects if LCS <50%, R flag results
		Dilution test	Each new sample matrix	1:5 dilution must agree within ±10% of the original determination	Perform post digestion spike addition	Apply J to all detects, UJ to non-detects if either of following exist: (1) dilution test not

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
						run (2) RPD ≥10%
SW6010B	ICP Metals	Post digestion spike addition	When dilution test fails	Recovery within 75-125% of expected results	Correct problem then reanalyze post digestion spike addition	none
		MS/MSD	One MS/MSD per every 40 samples.	QC acceptance criteria in table.	none	If recovery is greater than 125%, J all detects; if less than 75%, but greater than 30%, J all detects and UJ non-detects; If less than 30%, R all non-detects and J all detects; If the RPD of the MSD is outside 20, flag detects as J and non-detects as UJ
		MDL study	Once per 12 month period	Detection limits established shall be ≤ ½ the RLs in table	none	Apply R to all results for the specific analyte(s) in all samples analyzed
		Results reported between MDL and RL	none	none	none	Apply J to all results between MDL and RL

a. All corrective actions associated with project work shall be documented, and the laboratory shall maintain all records.
b. Flagging criteria are applied when acceptance criteria were not met and corrective action was not successful or corrective action was not performed.

A-10 Methods SW7041/7060A/7421/7740A/7841–Graphite Furnace Atomic Absorption (GFAA)

The Stabilized Temperature Platform Furnace (STPF) technique is used to quantitate low concentrations of metals in water and soil samples. The samples are digested then discrete aliquots of sample digestate are pipetted into a graphite tube with platform for analysis. The graphite tube is heated resistively by an electrical current. The sample solution is dried and charred to remove sample matrix components and then atomized at temperatures sufficient to vaporize the metal for measurement of the atomic absorption.

Matrix modification is used to eliminate interference effects and may also enhance the vaporization efficiency and allow lower detection limits. RLs for this analysis are listed in the following table. The calibration, QC, corrective action, and data flagging requirements are given in the following tables.

TABLE A-10.A
RLs for Graphite Furnace Atomic Absorption

		Water		Soil	
Parameter/Method	**Analyte**	**RL**	**Unit**	**RL**	**Unit**
SW7041	Antimony	6.0	µg/L	1.2	mg/kg
SW7060A	Arsenic	5.0	µg/L	1.0	mg/kg
SW7421	Lead	5.0	µg/L	1.0	mg/kg
SW7740A	Selenium	5.0	µg/L	1.0	mg/kg
SW7841	Thallium	2.0	µg/L	1.0	mg/kg

TABLE A-10.B
Matrix Precision and Accuracy Acceptance Criteria for Graphite Furnace Atomic Absorption (GFAA)

Method	**Analyte**	**Accuracy Water (% R)**	**Precision Water (% RPD)**	**Accuracy Soil (% R)**	**Precision Soil (% RPD)**
SW7041	Antimony	75–125	≤ 20	75–125	≤ 20
SW7060A	Arsenic	75–125	≤ 20	75-125	≤ 20
SW7421	Lead	75-125	≤ 20	75-125	≤ 20
SW7740A	Selenium	75-125	≤ 20	75-125	≤ 20
SW7841	Thallium	75-125	≤ 20	75-125	≤ 20

TABLE A-10.C
Summary of Calibration and QC Procedures for GFAA

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
SW7041	Antimony Arsenic Lead Selenium Thallium	Initial multipoint calibration (minimum 3 standards and a blank) One standard should be at the reporting limit	Daily initial calibration prior to sample analysis	Correlation coefficient ≥0.995 for linear regression	Correct problem then repeat initial calibration	Apply J flag to positive results and UJ flag to non-detects for specific analyte for all samples associated with the calibration
		Initial Calibration Verification (ICV)	Immediately after initial calibration	Analyte within ±10% of expected value	Correct problem then repeat initial calibration	Apply J flag to positive results and UJ flag to non-detects for specific analyte for all samples associated with the calibration
		Initial and continuing calibration blank	After every calibration verification (ICV and CCV)	No analyte detected ≥ RL	Correct problem then reanalyze calibration blank and all samples associated with blank	Apply U to all results for the specific analyte in all samples associated with the blank whose concentration is less than blank concentration
		Continuing Calibration verification (CCV)	After every 10 samples and at the end of the analysis sequence	The analyte within ±20% of expected value	Correct problem then repeat calibration and reanalyze all samples since last successful calibration	Apply J flag to positive results and UJ flag to non-detects for the specific analyte in all samples since the last acceptable calibration
		Method blank	One per analytical batch	No analytes detected ≥ RL	Correct problem then reprep and analyze method blank and all samples processed with the contaminated blank	Apply U to all results for the specific analyte in all samples in the associated analytical batch whose concentration is less than 5 times blank concentration
GFAA	Antimony Arsenic Lead Selenium Thallium	LCS for the analyte	One LCS per analytical batch	The laboratory should use control chart limits at 3 standard deviations; if not available 75-125% shall be used	Correct problem then reprep and analyze the LCS and all samples in the affected AFCEE analytical batch	For specific analyte in all samples in the associated analytical batch; if the LCS %R > UCL, apply J to all positive results

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
						if the LCS %R < LCL, apply J to all positive results, apply UJ to all non-detects
						if LCS <10%, R flag results
		Dilution Test; 1+4 dilution test	Each preparatory batch	Five times dilution sample result must be ±10% of the undiluted sample result	Perform recovery test	Apply J to all sample results if either of following exist: (1) dilution test not run (2) RPD ≥10%
		Recovery test	When dilution test fails	Recovery within 85-115% of expected results	Run all samples by the method of standard addition	Apply J to all sample results (for same matrix) in which method of standard addition was not run when recovery outside of 85-115% range
GFAA	Antimony Arsenic Lead Selenium Thallium	MS/MSD	One MS/MSD per every 40 samples	QC acceptance criteria in table	none	If recovery is greater than 125%, J all detects; if less than 75%, but greater than 30%, J all detects and UJ non-detects; If less than 30%, R all non-detects and J all detects. If the RPD of the MSD is outside 20, flag detects as J and non-detects as UJ
		MDL study	Once per 12 month period	Detection limits established shall be ≤ ½ the RLs in tables	none	Apply R to all results for the specific analyte in all samples analyzed
		Results reported between MDL and RL	none	none	none	Apply J to all results between MDL and RL

a. All corrective actions associated with Kelly AFB project work shall be documented, and the laboratory shall maintain all records.

b. Flagging criteria are applied when acceptance criteria were not met and corrective action was not successful or corrective action was not performed.

A-11 Method SW7470A/SW7471A–Mercury Manual Cold-Vapor Technique

Water and soil samples are analyzed for mercury using methods SW7470A and SW7471A, respectively. This method is a cold-vapor, flame-less atomic absorption (AA) technique based on the absorption of radiation by mercury vapor. Mercury is reduced to the elemental state and aerated from solution in a closed system. The mercury vapor passes through a cell positioned in the light path of an AA spectrophotometer. Mercury concentration is measured as a function of absorbance. The RLs for these methods are listed in the following table. The calibration, QC, corrective action, and data flagging requirements are given in the following tables.

TABLE A-11.A
RLs for Method SW7470A/SW7471A

		Water		Soil	
Parameter/Method	**Analyte**	**RL**	**Unit**	**RL**	**Unit**
SW7470A (W) SW7471A (S)	Mercury	0.5	µg/L	0.1	mg/kg

TABLE A-11.B
QC Acceptance Criteria for Method SW7470A/SW7471A

Method	**Analyte**	**Accuracy Water (% R)**	**Precision Water (% RPD)**	**Accuracy Soil (% R)**	**Precision Soil (% RPD)**
SW7470A/SW7471A	Mercury	75–125	≤ 20	75–125	≤ 35

TABLE A-11.C
Summary of Calibration and QC Procedures for Method SW7470A/SW7471A

Method	**Applicable Parameter**	**QC Check**	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action[a]**	**Flagging Criteria[b]**
SW7470A SW7471A	Mercury	Initial multipoint calibration (minimum 4 standards and a blank)	Daily initial calibration prior to sample analysis	Correlation coefficient ≥0.995 for linear regression	Correct problem then repeat initial calibration	Apply R to all results for specific analyte for all samples associated with the calibration
		Initial Calibration Verification (ICV)	Immediately after initial calibration	Analyte within ±20% of expected value	Correct problem then repeat initial calibration	Apply J flag to positive results and UJ flag non-detects for specific analyte for all samples associated with the calibration
		Initial and continuing calibration blank	After every calibration verification (ICV and CCV)	No analyte detected ≥ RL	Correct problem then reanalyze calibration blank and all samples associated with blank	Apply U to all results for the specific analyte in all samples associated with the blank whose concentration is less than 5 times

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
						blank concentration
		Calibration verification	After every 10 samples and at the end of the analysis sequence	The analyte within ±20% of expected value	Correct problem then repeat calibration and reanalyze all samples since last successful calibration	Apply J flag to positive results and UJ flag non-detects for the specific analyte in all samples since the last acceptable calibration
		Method blank	One per analytical batch	No analytes detected ≥ RL	Correct problem then reprep and analyze method blank and all samples processed with the contaminated blank	Apply U to all results for the specific analyte in all samples in the associated analytical batch whose concentration is less than 5 times the blank concentration
SW7470A SW7471A	Mercury	LCS for the analyte	One LCS per analytical batch	The laboratory should use control chart limits at 3 standard deviations; if not available 80-120% shall be used	Correct problem then reprep and analyze the LCS and all samples in the affected AFCEE analytical batch	For specific analyte in all samples in the associated analytical batch; if the LCS %R > UCL, apply J to all positive results if the LCS %R < LCL, apply J to all positive results, apply UJ to all non-detects if LCS <10%, R flag data
SW7470W S7471A	Mercury	MS/MSD	One MS/MSD per every 40 samples	QC acceptance criteria in table	none	If recovery is greater than 125%, J all detects; if less than 75%, but greater than 30%, J all detects and UJ non-detects; If less than 30%, R all non-detects and J all detects. If the RPD of the MSD is outside 20, flag detects as J and non-detects as UJ
		MDL study	Once per 12 month period	Detection limits established shall be ≤ ½ the RLs in	none	Apply R to all results for the specific analyte

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
				table		in all samples analyzed
		Results reported between MDL and RL	none	none	none	Apply J to all results between MDL and RL

a. All corrective actions associated with project work shall be documented, and the laboratory shall maintain all records.

b. Flagging criteria are applied when acceptance criteria were not met and corrective action was not successful or corrective action was not performed.

A-12 Method SW9010B/SW9012A-Total Cyanide and Cyanide Amenable to Chlorination

Water and waste samples are analyzed for total cyanide using method SW9010B or SW9012A. These methods are equivalent in principle of analysis; SW9010B is a manual procedure, and SW9012A is an automated procedure.

Both methods are used to determine the concentration of inorganic cyanide in aqueous wastes and leachates . The methods detect inorganic cyanides that are present as either sample soluble salts or complex radicals. It is used to determine values for both total cyanide and cyanide amenable to chlorination. The cyanide is released by refluxing the sample with a strong acid and catalyst and distillation. Total cyanide in soils is determined after acidification of the soil and distillation. The cyanide ion in the absorbing solution is then determined by spectrophotometry for method SW9010B and by automated colorimetry for method SW9012A. RLs for cyanide are listed in the following table. The calibration, QC, corrective action, and data flagging requirements are given in the following tables.

TABLE A-12.A
RLs for Method SW9010B/SW9012A

Parameter/Method	Analyte	RL	Unit
SW9010B/SW9012A	Total cyanide (Water)	10	µg/L
	Total cyanide (Soil)	0.5	mg/kg

TABLE A-12.B
QC Acceptance Criteria for Method SW9010B/SW9012A

Method	Analyte	Accuracy Water/Soil (% R)	Precision Water/Soil (% RPD)
SW9010B SW9012A	Total cyanide	79–115	≤ 20

TABLE A-12.C
Summary of Calibration and QC Procedures for Method SW9010B/SW9012A

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
SW9010B/ SW9012A	Cyanide	Multipoint calibration curve (six standards and a calibration blank)	Initial daily calibration prior to sample analysis	Correlation coefficient ≥0.995 for linear regression	Correct problem then repeat initial calibration	Apply R to the result for cyanide for all samples associated with the calibration
		Distilled standards (one high and one low)	Once per multipoint calibration	Cyanide within ±10% of true value	Correct problem then repeat distilled standards	Apply J to positive results and UJ to non-detects for the specific analyte for all samples associated with

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
						the calibration
		Second-source calibration verification	Once per stock standard preparation	Cyanide within ±15% of expected value	Correct problem then repeat initial calibration	Apply J to positive results and UJ to non-detects for the specific analyte for all samples associated with the calibration
		Demonstrate ability to generate acceptable accuracy and precision using four replicate analyzes of a QC check sample	Once per analyst	QC acceptance criteria in table	Recalculate results; locate and fix problem with system and then rerun demonstration for those analytes that did not meet criteria	Apply R to the specific analyte result for all samples analyzed by the analyst
		Method blank	One per analytical batch	No analytes detected ≥ RL	Correct problem then reprep and analyze method blank and all samples processed with the contaminated blank	Apply U to the result for the specific analyte in all samples in the associated analytical batch whose concentration is less than 5 times blank concentration
SW9010B/ SW9012A	Cyanide	LCS for all analytes	One LCS per analytical batch	QC acceptance criteria in table	Correct problem then reprep and analyze the LCS and all samples in the affected AFCEE analytical batch	For the specific analyte in all samples in the associated analytical batch; if the LCS %R > UCL, apply J to all positive results if the LCS %R < LCL, apply J to all positive results, apply UJ to all non-detects if LCS <10%, R flag results
		MS/MSD	One MS/MSD per every 40 samples	QC acceptance criteria in table	none	none
		MDL study	Once per 12 month period	Detection limits established shall be ≤ ½ the RLs in table	none	Apply R to all results for the specific analyte in all samples analyzed
		Results reported between MDL and RL	none	none	none	Apply J to all results between MDL and RL